

The invention relates to a device (10) for use in connection with a fabric (F) in a paper machine, in particular a device (10) for use in connection with a fabric in a former or a press section of a paper machine. The device (10) comprises subassemblies which accomplish at least two of the following functions: guiding, spreading and/or cleaning of the fabric (F). The device (10) comprises an automatic guide (20) and a guide roll (40) for guiding the fabric (F), a curved spreader roll (30) for spreading the fabric (F), and a suction unit (19) for cleaning the fabric (F).

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

Device for use in connection with
a fabric in a paper machine

5

The invention relates to a device according to the preamble of claim 1.

10 As known in the prior art, in connection with the wet end fabrics of a paper machine, for example, in guiding, spreading and cleaning of a felt in a press section, a separate device is used for each purpose, at least one of each of them being arranged for said purpose in connection with each fabric. In the arrangements known in the state of the art, the devices used for these purposes are an automatic guide, a manual guide, a guide roll, a curved spreader roll, suction units and jets. Such
15 separate devices cause extra costs, they take space and require support structures in connection with the frame structures of the machine.

One problem with the suction units used in connection with the separate devices known in the prior art has been that the width of the suction slot has not always been
20 adjustable so that several suction units may have been needed for each felt.

One problem in connection with suction units has also been that the suction unit rubs against the felt so that the press section consumes more power.

25 In the arrangements known in the state of the art, in fast machines in particular, the felt has worn quickly, which has been partly due to the rubbing of the ceramic covers of felt suction units. Rolls and mechanical impurities also wear felts.

The spreader rolls in the arrangements known in the prior art have had a constant
30 curvature, and thus it has not been possible to adjust their spreading effect.

An object of the invention is to provide a device in which the above-noted problems with the prior art devices are not encountered.

An object of the invention is also to provide a device which is of low cost.

5

One further non-indispensable object of the invention is also to disclose a device in which the width of the suction slot in the suction unit is adjustable.

One further non-indispensable object of the invention is also to disclose a device in which the curvature of the spreader roll can be adjusted.

10

With a view to achieving the objectives stated above as well as those that will come out later, the device according to the invention is mainly characterized in what is set forth in the characterizing part of claim 1.

15

In accordance with the invention, the device comprises device components that accomplish at least two of the following functions: guiding, spreading and/or cleaning of a fabric. An advantageous embodiment example of the invention comprises the above-mentioned functions, all in the same device.

20

The device according to the invention thus comprises in accordance with an advantageous embodiment an automatic guide, a guide roll, a curved spreader roll and a suction unit in a single device assembly. Jets may also be incorporated in the device assembly.

25

In accordance with an advantageous additional feature of the invention, instead of prior known ceramic ribs, suction ribs that can be bent, for example, plastic ribs or equivalent are used as suction ribs of the suction slot of the suction unit, which is possible because the fabric is supported by rollers in the device. The adjustment of plastic ribs for regulating the width of the suction slot is easy to carry out and, when needed, the suction width can be increased, for example, at the edges with respect to the centre because the plastic rib is easy to bend.

30

Advantageously, in accordance with an additional feature of the device according to the invention, the journalling of the rollers (the guide roll and the spreader roll are formed of rollers) is accomplished by means of bearings lubricated with circulating grease or circulating oil or by means of permanently lubricated bearings, and the device can be turned upside down by using a hydraulic motor or cylinder for the purpose of cleaning. Advantageously, the end seals of the suction slot in the suction unit of the device are accomplished, for example, by means of adjustable overlapping joints. The suction pipe system of the suction unit is laid from both the driving side and the tending side, thus achieving a good and uniform suction effect.

The functions of the curved spreader roll are provided by placing the rollers forming the spreader roll in a form which is suitably curved. In a press section, the deflections of tubular rolls can be compensated for, for example, by placing the rollers at the edges of the machine at different heights using, for example, spacer plates under the bearing housings.

In felt guidance, the manual guide of the prior art arrangements has been omitted and the automatic guide is most preferably accomplished as a mechanical guide comprising linear guides and a worm gear, whereby the problems of known devices are avoided. The automatic guide is provided with such a movement length that no separate manual guide is needed. The movement length is, for example, 140 mm. In connection with the device in accordance with the invention, as a measuring head is advantageously used a non-contacting sensor or a contacting measuring transducer, i.e. a felt and wire tracking device.

The invention provides substantial savings in costs as the space requirement and the complexity of the device assembly are reduced. When used on fast machines, the service life of the fabric increases if the wear of the felt loop constitutes the main reason for replacement of the felt. The other main reasons for replacement of the felt include, for example, hardening, clogging, contamination or a scheduled shutdown.

Only one device according to the invention is needed for each fabric because the width of the suction slot of the suction unit part can be adjusted, which allows optimization to be accomplished for each individual felt.

- 5 The power consumption of the press is reduced because the suction unit is less rubbing and fewer rolls are used than in the prior art arrangements since separate guide rolls and spreader rolls are no longer needed as they have been formed of rollers in connection with the device.
- 10 Curvature, i.e the power of spreading, can be regulated, in which connection the spreading effect can be regulated, and automatic control is self-retaining owing to a trapezoid-thread screw used in accordance with an advantageous example. It is easy to add automation to the device according to the invention, for example, controls and their automation can be readily incorporated, which increases the means of affecting
- 15 the felt loop, for example, the profiling of the moisture of the felt by adjusting the width of the suction slot.

In the following, the invention will be described in more detail with reference to the figures of the accompanying drawing, to the details of which the invention is,

20 however, not by any means intended to be narrowly confined.

Figure 1 schematically depicts one advantageous embodiment of the device according to the invention when viewed from the end, and

- 25 Figure 2 schematically depicts the device illustrated in Fig. 1 when viewed in the longitudinal direction, and

Figure 3 depicts some possible applications of the device according to the invention for use in connection with press felts of a press section, and

30

Figure 4 schematically depicts one advantageous modification of the embodiment illustrated in Figs. 1 and 2 when viewed from the end.

The advantageous embodiment example of the invention shown in Figs. 1 and 2 comprises a suction unit part 19 which comprises a suction chamber 16 connected to the driving and tending sides by means of suction pipes 11 (tending side) and 18 (driving side). An adjustable suction slot 15 is formed between bendable suction ribs, preferably plastic ribs 13 and 14, a fabric F being passed to run over said suction slot 15 in a direction S. A spreader roll 30 which is adjustable in its curvature has been placed before the suction ribs 13, 14 in the running direction of the fabric F, which spreader roll is formed of rollers 31 between which adjustable bearing housings 32 have been placed, said bearing housings enabling the set of rollers formed by the rollers 31, i.e. the spreader roll 30, to be made curved. A guide roll 40 made up of rollers 41 and bearing means 42 therebetween has been placed on the outlet side of the suction slot 15. An automatic guide 20 comprises linear guides 22 and a worm gear 23 as well as a movement base 21 and advantageously a trapezoid-thread screw 24. Doctor boxes of the device 10 have been denoted with the reference numeral 17 and end seals of the suction slot 15 with the reference numeral 12. The end seals 12 may be, for example, adjustable seals based on an overlapping joint. The suction ribs 13,14 are adjustable in position and bendable for adjusting the suction slot 15.

The device in accordance with the invention thus comprises according to the advantageous embodiment shown in Figs. 1 and 2 an automatic guide 20, a guide roll 40, a curved spreader roll 30 and a suction unit 19 as a single device assembly. The adjustment of the suction unit part 19 and the suction ribs 13,14 in order to adjust the width of the suction slot 15 is easy to accomplish, for example, by increasing the suction width at the edges with respect to the centre because the suction ribs 13,14 can be bent to a desired position. Advantageously, the journalling arrangements of the rollers 41,31 in the guide roll 40 and in the spreader roll 30 have been accomplished by means of bearings lubricated with circulating grease or circulating oil or by means of permanently lubricated bearings. The rollers 31,41 can be placed at different heights at the edges of the machine by using, for example, spacer plates under the bearing housings. The device 10 can be turned upside down by using a hydraulic motor or cylinder (not shown) for the purpose of cleaning.

Fig. 3 shows a schematic application of a press section 50 in which devices 10 according to the invention have been placed in connection with fabrics F; 51,52,53, 54. The press section 50 illustrated in the figure comprises two press nips N1, N2 formed between press rolls 55,56 and 57,58, respectively. The guide rolls of the fabrics have been denoted with the reference numeral 59 and rolls which comprise a suction slot have been denoted with the reference numeral 61. A roll 60 adjustable in position is situated at the beginning of the press section in connection with a suction roll 61, a paper web being passed between said rolls from a former.

10 In the schematic modification of Fig. 4 of the embodiment shown in Figs. 1 and 2, the position of the suction ribs 13,14 is advantageously curved with respect to the fabric. In that connection, the fabric does not run straight but drawn into a curve, in which connection its friction is lowest. In other respects, the illustration of Fig. 4 corresponds to the embodiment shown in Figs. 1 and 2. In Fig. 4, the parts corresponding to those of Figs. 1 and 2 have been denoted with the same reference numerals.

A felt and wire tracking device is advantageously used in connection with the device according to the invention, said device being based on an angle sensor and on a flap lying against the edge of the felt as well as on a measuring head, in which the flap of the measuring head lying against the edge of the felt remains in contact with the edge of the felt by means of a compression spring placed inside an oil-containing cylinder, the structure of the return mechanism of said spring resembling the structure of a conventional shock absorber. Oil or an equivalent medium flows through a piston from holes making the movement of the flap more stable, and the return force is adjustable. Two measuring heads are used for each fabric, and the signal is filtered. An angle sensor of strong construction is used as the angle sensor of the measuring head, which withstands the amounts required for longitudinal and radial load, and the measuring member constructed inside its transducer is a non-wearing capacitive transducer operating without a mechanical contact. A sensor can be used both in the measuring head and as a position sensor of the guide, in which connection the adapting of output and input impulses is easy.

Above, the invention has been described only with reference to one of its advantageous embodiment examples, to the details of which the invention is not intended by any means to be narrowly confined. Many variations and modifications are feasible within the scope of the inventive idea defined in the following claims.

Claims

1. A device (10) for use in connection with a fabric (F) in a paper machine, in particular a device (10) for use in connection with a fabric in a former or a press section of a paper machine, characterized in that the device (10) comprises subassemblies which accomplish at least two of the following functions: guiding, spreading and/or cleaning of the fabric (F).
2. A device according to claim 1, characterized in that the device (10) comprises an automatic guide (20) and a guide roll (40) for guiding the fabric (F), a curved spreader roll (30) for spreading the fabric (F), and a suction unit (19) for cleaning the fabric (F).
3. A device according to claim 1 or 2, characterized in that a suction slot (15) of the suction unit (19) of the device (10) can be adjusted and that the suction slot (15) is formed between two suction ribs (13,14).
4. A device according to claim 3, characterized in that the suction ribs are plastic ribs (13,14).
5. A device according to claim 3 or 4, characterized in that the suction ribs (13, 14) can be adjusted in position and bent.
6. A device according to any one of claims 1 to 5, characterized in that the automatic guide (20) of the device (10) comprises linear guides (22), a worm gear (23), a trapezoid-thread screw (24), and a movement base (21).
7. A device according to any one of claims 1 to 6, characterized in that the spreader roll (30) of the device (10) is formed of rollers (31) having adjustable bearing housings (32) placed in the spaces therebetween in order to adjust the curvature of the spreader roll (30).

8. A device according to any one of claims 1 to 7, **characterized** in that the guide roll (40) of the device (10) is formed of rollers (41) having bearings (42) placed therebetween.
- 5 9. A device according to any one of claims 1 to 8, **characterized** in that suction pipes (11, 18) are arranged in connection with a suction chamber (16) of the suction unit (19) of the device (10), one of said tubes extending to the tending side and the other to the driving side.
- 10 10. A device according to any one of claims 1 to 9, **characterized** in that end seals (12) of the suction slot (15) in the suction unit (19) of the device (10) are based on an adjustable overlapping joint.
11. A device according to any one of claims 1 to 9, **characterized** in that the
- 15 curvature of the spreader roll (30) of the device (10) is regulated by adjusting the height position of the bearing housings (32).

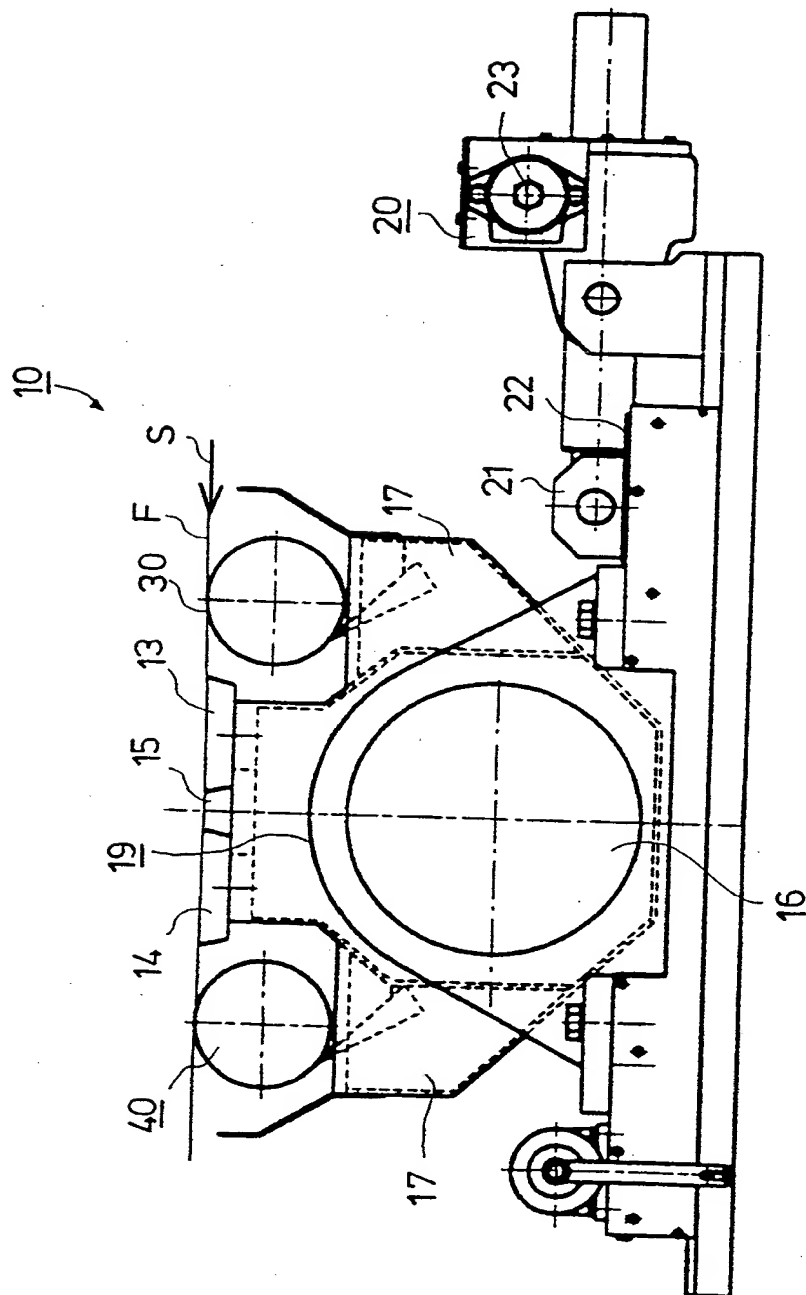


FIG. 1

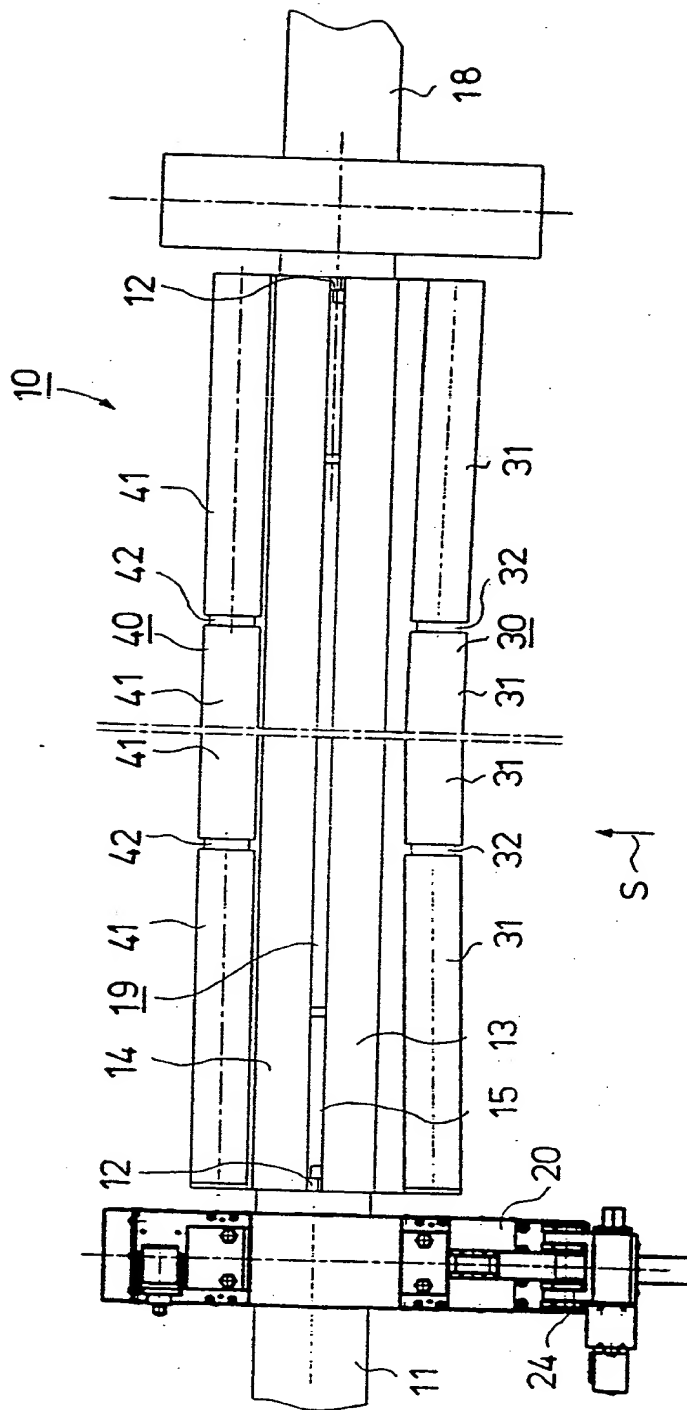


FIG. 2

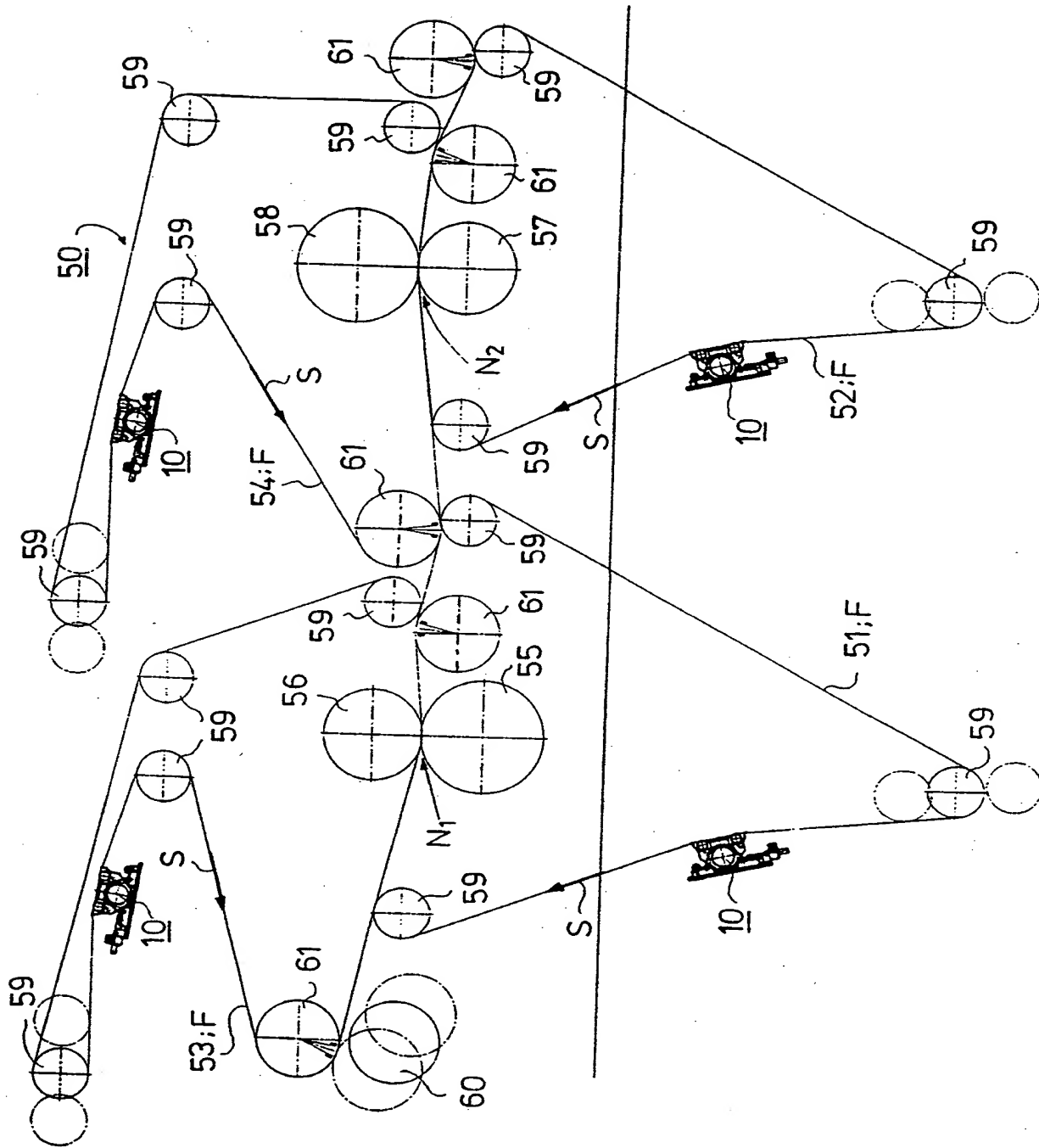


FIG. 3

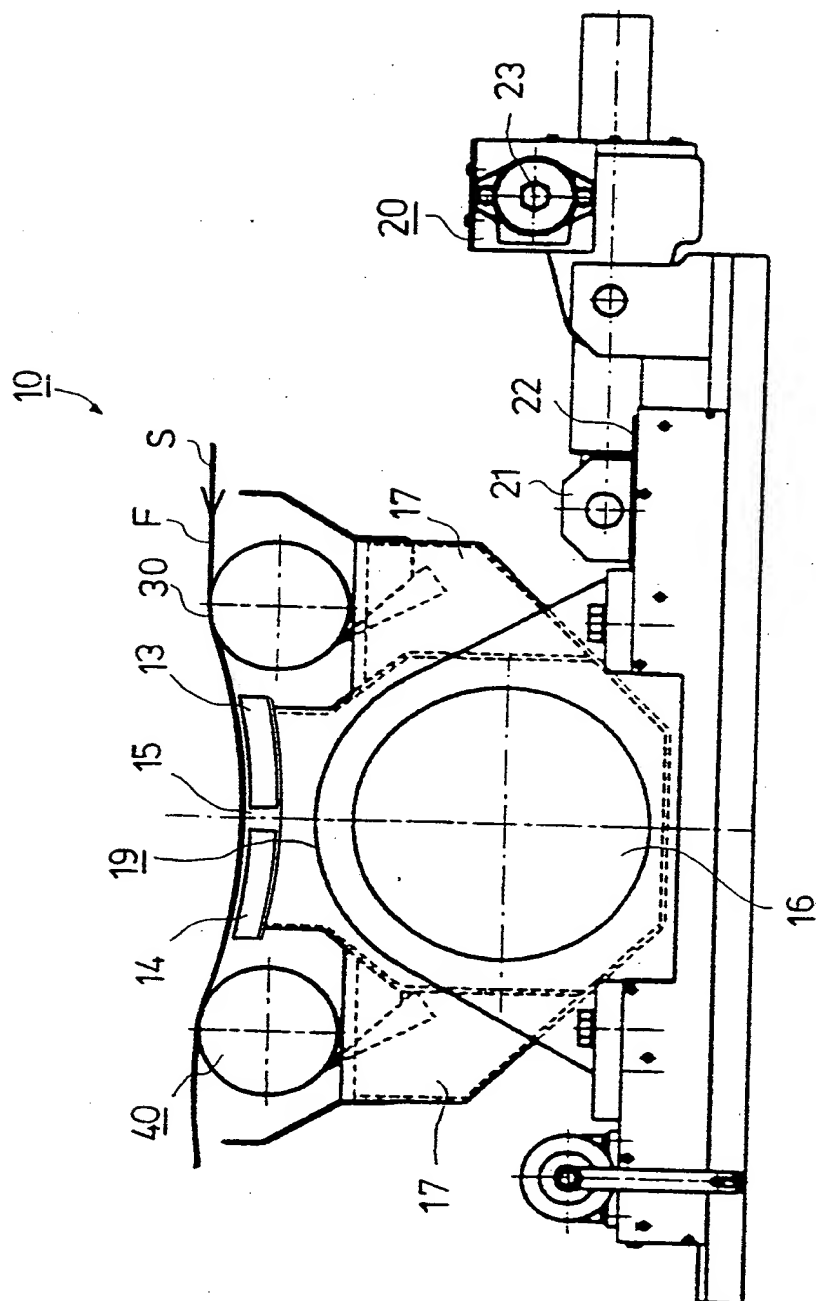


FIG. 4

INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 00/00115

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: D21F 1/32, D21F 1/36

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: D21F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 109444 C (HANS NEIDHARDT ET AL.), 11 April 1900 (11.04.00), Whole document	1
Y	--	2-11
Y	DE 2510492 A1 (DIETER RAUCHMAUL KUNSTSTOFFVERARBEITUNG), 23 Sept 1976 (23.09.76), Claims, Figures	2-5,9,10
Y	US 4077834 A (STARK), 7 March 1978 (07.03.78), figure 1, claims 1,2, abstract	6
A	--	1-11

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

28 June 2000

Date of mailing of the international search report

05-07-2000

Name and mailing address of the ISA:

Swedish Patent Office
Box 5055, S-102 42 STOCKHOLM

Facsimile No. +46 8 666 02 86

Authorized officer

Ulf Nyström/OGU

Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 00/00115

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4669646 A (OINONEN), 2 June 1987 (02.06.87), abstract, Claims, Figures --	2,7,8,11
Y	DE 2139159 A1 (JAGENBERG-WERKE AG), 15 February 1973 (15.02.73), page 3, line 10 - page 5, line 5, Figures --	2,7,8,11
X	US 3830691 A (TRUESDALE ET AL.), 20 August 1974 (20.08.74), abstract --	1
X	EP 0515339 A1 (VALMET PAPER MACHINERY INC.), 25 November 1992 (25.11.92), abstract -- -----	1

INTERNATIONAL SEARCH REPORT

Information on patent family members

02/12/99

International application No.

PCT/FI 00/00115

Patent document cited in search report			Publication date	Patent family member(s)		Publication date
DE	109444	C	11/04/00	NONE		
DE	2510492	A1	23/09/76	NONE		
US	4077834	A	07/03/78	AT	345086 B	25/08/78
				AT	628776 A	15/12/77
				BE	845903 A	31/12/76
				CH	598410 A	28/04/78
				DE	2540923 A	24/03/77
				DK	144039 B,C	23/11/81
				DK	401776 A	14/03/77
				FI	762584 A	14/03/77
				FR	2323810 A,B	08/04/77
				IT	1065255 B	25/02/85
				NL	7610107 A	15/03/77
				NO	142819 B	14/07/80
				NO	763027 A	15/03/77
				SE	420748 B,C	26/10/81
				SE	7609849 A	14/03/77
US	4669646	A	02/06/87	CA	1253895 A	09/05/89
				DE	3426899 A	31/01/85
				FI	69440 B,C	31/10/85
				FI	832680 A	23/01/85
				FI	842751 A	23/01/85
				FR	2549456 A,B	25/01/85
				GB	2144106 A,B	27/02/85
				JP	1719104 C	14/12/92
				JP	4005628 B	03/02/92
				JP	60040370 A	02/03/85
				SE	456157 B,C	12/09/88
				SE	8403726 A	23/01/85
DE	2139159	A1	15/02/73	AT	316979 A,B	15/06/74
				BE	787201 A	01/12/72
				BR	7205286 D	00/00/00
				ES	404842 A	16/06/75
				FR	2149884 A	30/03/73
				GB	1340292 A	12/12/73
				IT	964476 B	21/01/74
				SE	378373 B,C	01/09/75
				US	3786975 A	22/01/74

INTERNATIONAL SEARCH REPORT

Information on patent family members

02/12/99

International application No.

PCT/FI 00/00115

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3830691 A	20/08/74	AU 6342373 A	12/06/75
		CA 952750 A	13/08/74
		CA 1027403 B	07/03/78
		DE 2362086 A,B,C	27/06/74
		FI 61535 B,C	30/04/82
		FR 2210698 A,B	12/07/74
		GB 1435909 A	19/05/76
		IT 1000832 B	10/04/76
		JP 905935 C	18/04/78
		JP 49094910 A	09/09/74
		JP 51046163 B	07/12/76
		SE 406609 B,C	07/12/78
		ZA 7309333 A	30/10/74
EP 0515339 A1	25/11/92	SE 0515339 T3	
		AT 160395 T	15/12/97
		DE 69223176 D,T	09/04/98
		FI 100412 B	00/00/00
		FI 912474 A	22/11/92
		US 5403447 A	04/04/95